Determination of *Toxoplasma gondii* Antibody Prevalence in Midwest Market Swine

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Summary: Pork has been identified as one of the food source(s) for human exposure to *Toxoplasma gondii*. This project was designed to determine the current prevalence of *Toxoplasma gondii* antibodies in the Midwestern USA market swine population. Test samples were selected, using random numbers generated from the Excel database, from approximately 2,500 daily meat juice samples submitted for Aujeszky's Disease from eight Iowa abattoirs. Producer identification and lot size were recorded for each lot. Two hundred fifty samples were selected for 12 consecutive weeks – total of 15,014 samples. The presence of antibodies was determined using ELISA test kits by Safepath Laboratories. The prevalence for all samples was 0.75 % with a higher prevalence found in lots of 20 - 40 compared to 150 - 190 head. Additional on-farm evaluations of exposure risk factors are required to determine an association between sero-prevalence and lot size and to develop suitable prevention strategies.

Introduction: *Toxoplasma gondii*, an intracellular protozoan of cats, is an important public health concern. Human infection may occur by two primary routes: 1) direct contact with soils or foods contaminated with cat feces; or 2) consumption of undercooked meat from an animal previously infected with *Toxoplasma gondii*. *Toxoplasma gondii* infections in rodents, swine, sheep, cattle and perhaps poultry result from exposure to cats feces or contaminated environments. The infectious stage (bradyzoites) may survive in muscle and brain tissues for the animal's life. Pork has been identified as one food source for this parasite.

Production practices may influence the prevalence of infected animals. Infected cats shed large numbers of oocysts in feces for approximately 10-20 d. Once shed, oocysts are environmentally stable. Therefore the environment remains contaminated for extended periods after cats are removed or become on-infectious carriers. Few oocysts are required to infect swine. Removal of direct contact with cats, and cat feces or a contaminated environment minimizes potential transmission. Keeping cats from contact with feed or soils near production reduces exposures. It is possible that soil transferred on boots may be sufficient for infection of swine. Rodents (mice predominately) may be a source of infection for cats and for swine. Prior prevalence studies have indicated infection levels of 20 - 43 % in breeding animals and 0.14 - 5 % in finishers depending on the sample populations, locations of operations and sampling period (R. Gamble, personal communication, 2001). In many cases outside production and exposures to cats or cat feces were identified as risk factors (Leighty, J.C., 1990; Weigel et. al., 1995). As pork production has become more confined a question has been raised about the prevalence of Toxoplasma infections.

Objectives: To evaluate the presence of Toxoplasma antibodies as measured by a meat juice-based ELISA detection procedure in Midwestern market swine.

Materials and methods: Meat juice samples were selected from a population collected for the PRV market swine surveillance project. This market surveillance collected four (4) meat samples from each lot of swine at eight (8) high volume Iowa abattoirs. Approximately 600 lots were collected daily and submitted to the Iowa State University meat juice processing laboratory of processing and

PRV antibody analysis. Each sample was maintained with a unique identifier that enabled trace back to the submitting producer.

Samples for Toxoplasma antibody detection were selected randomly from the daily submissions during the spring of 2002. Two hundred fifty (250) samples were selected each day for 12 consecutive weeks (60 sample d) – total of 15,014 samples. As part of the random sampling algorithm only one sample from a producer was selected each day, even if multiple lots were submitted to single or multiple plants from that producer. Producer identification and lots size submitted were recorded. The presence of Toxoplasma antibodies was determined using the ELISA test kits supplied by Safepath Laboratories (Carlsbad, Calif. USA). Samples were diluted 1:10, according to manufacturer's recommendations for meat juice prior to testing. Results were reported as positive using a > 0.20 O.D. breakpoint.

Results/Discussion: A total of 15,014 samples were collected from 3690 producers from 16 Midwestern states. Mean lot size was 92 head, but a clear bi-modal distribution existed. Approximately 60 % of the lots were from 20 - 50 head/lot and 30 % from 160 - 200 head/lot, with the remainder arrayed between these lot sizes. One hundred thirteen (113) samples were positive for an individual animal prevalence of 0.75 %. Eighty-eight (88, 2.3%) producers were identified with a single positive sample. Sixteen (16) producers, including four identified as order buyers/buying stations, had two or more positive samples. Comparisons of the lot size/positive values interaction indicated that 86/113 positives were found in lot sizes < 50 head, and were 2 times more likely to be serologically positive than larger lots (OR= 2.1, 95% CL, 1.4-3.5). Only 11/113 were identified in lots > 100 head. All producers with multiple positive results were from the smaller lots.

Conclusions: The observed level of 0.75 % is consistent with a continued prevalence reduction observed in earlier studies and observations (0.80%) in the 2000 NAHMS survey. The association between positive samples in the smaller lot sizes may indicate a higher risk associated with more extensive production practices, however other confounding factors may be involved. These results are consistent with earlier evaluations of risk factors at the production level. These risk factor issues require further examination as production-based Toxoplasma control programs are developed. This project also demonstrates the value of meat juice technology in market swine surveillance of zoonotic disease.

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